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HAIR COSMETIC INGREDIENT  
[Mohatsu Kesho Ryo]

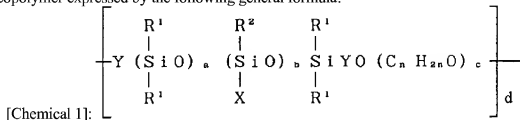
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Claim 1

A hair cosmetic ingredient characterized by the inclusion of a reactive silicone-type block copolymer expressed by the following general formula:



[In the formula, R<sup>1</sup> signifies a monovalent hydrocarbon group excluding an aliphatic unsaturated one, whereas X signifies a reactive functional group expressed by the following formula: -R<sup>3</sup>-Z (in the formula, R<sup>3</sup> signifies a direct bond or divalent hydrocarbon group in possession of 1 ~ 20 carbon atoms, whereas Z signifies a group inclusive of an amino group, group inclusive of an ammonium group, or group inclusive of an epoxy group), whereas R<sup>2</sup> signifies either R<sup>1</sup> or X, whereas n is an integer of 2 ~ 4, whereas a is an integer of at least 2, whereas b is an integer of at least 1, whereas c is an integer of at least 4, whereas d is an integer of at least 2, whereas Y signifies a divalent organic group coupled, via carbon-silicon, with an adjacent silicon atom and, via an oxygen atom, with a polyoxyalkylene block, whereas the average molecular weight of each siloxane block is approximately 250 ~ approximately 10,000, whereas the average molecular weight of each polyoxyalkylene block is approximately 200 ~ approximately 10,000, whereas siloxane blocks constitute approximately 25 ~ approximately 95 wt% of the copolymer, whereas said block copolymer bears an average molecular weight of at least approximately 1,000].

#### Detailed explanation of the invention

[0001]

(Technical fields to which the invention belongs)

The present invention concerns a hair cosmetic ingredient which includes a specified reactive silicone-type block copolymer and which can be used as shampoo agents, conditioner agents, set lotion agents, hair spray agents, permanent wave agents, mousse agents, hair dyeing agents, etc.

[0002]

(Prior art)

Head hairs are washed with shampoos, etc., rinsed with conditioner agents, protected by hairdressing agents, mousse agents, etc., and set with hair spray agents, set lotions, etc. Permanent [wave] agents and/or hair dyeing agents may, furthermore, be used. These compositions applied to hairs are referred to as "hair cosmetic ingredients," whereas vegetable oils, animal oils, mineral oils, synthetic oils, etc. are mixed with the same for the purpose of protecting head hairs.

[0003]

Thanks to the recent technical advancement of silicone-type polymers, in particular, various polysiloxane polymers have been synthesized, and they have come to be used as main components of hair cosmetic ingredients by virtue of the peculiar properties thereof. Above all, the present patent applicant proposed, in Japanese Patent Application Publication Kokai No. Hei 4[1992]-211605, a hair cosmetic ingredient with which a specified linear polysiloxane-polyoxyalkylene block copolymer has been mixed as a hair cosmetic ingredient capable of exerting antistatic effects on hairs, of enhancing the combing friendliness, of yielding favorable finished textural attributes & luster, of imparting voluminous, bulky, & moist impressions, and of enhancing emulsifying & foaming effects.

[0004]

A coating film formed on hair by the aforementioned hair cosmetic ingredient, however, is a temporary one, which is flawed in that its effects become easily attenuated as a result of daily hair care treatments such as shampooing, blowing, brushing, etc. Moreover, hair cosmetic ingredients with which silicones have been mixed have come to be widely used in recent years, and hair cosmetic ingredients capable of yielding textural attributes more favorable than those yielded by silicone-mixed hair cosmetic ingredients of the prior art have come to be strongly desired.

[0005]

(Problems to be solved by the invention)

The objective of the present invention is to provide a hair cosmetic ingredient capable of exerting antistatic effects on hairs, of enhancing the combing friendliness, of yielding not only finished textural attributes superior to those yielded by silicone-mixed hair cosmetic ingredients of the prior art but luster, of imparting voluminous, bulky, & moist impressions, of yielding a favorable settability, of enhancing emulsifying & foaming effects, and of effectively preserving these effects in response to daily hair care treatments such as shampooing, blowing, brushing, etc.

[0006]

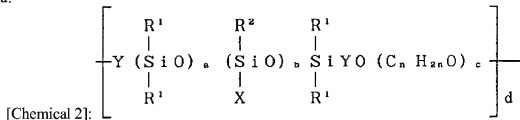
(Mechanism for solving the problems)

The present inventors compiled intensive researches on the aforementioned problems, as a result of which the present invention has been completed after it had been discovered that the aforementioned problems can be solved by a specified silicone-type block copolymer to which a reactive group has been introduced.

[0007]

(Abstract of the invention)

The present invention therefore provides a hair cosmetic ingredient characterized by the inclusion of a reactive silicone-type block copolymer expressed by the following general formula:



[In the formula, R<sup>1</sup> signifies a monovalent hydrocarbon group excluding an aliphatic unsaturated one, whereas X signifies a reactive functional group expressed by the following formula: -R<sup>3</sup>-Z (in the formula, R<sup>3</sup> signifies a direct bond or divalent hydrocarbon group in possession of 1 ~ 20 carbon atoms, whereas Z signifies a group inclusive of an amino group, group inclusive of an ammonium group, or group inclusive of an epoxy group), whereas R<sup>2</sup> signifies either R<sup>1</sup> or X, whereas n is an integer of 2 ~ 4, whereas a is an integer of at least 2, whereas b is an integer of at least 1, whereas c is an integer of at least 4, whereas d is an integer of at least 2, whereas Y signifies a divalent organic group coupled, via carbon-silicon, with an adjacent silicon atom and, via an oxygen atom, with a polyoxyalkylene block, whereas the average molecular weight of each siloxane block is approximately 250 ~ approximately 10,000, whereas the average molecular weight of each polyoxyalkylene block is approximately 200 ~ approximately 10,000, whereas siloxane blocks constitute approximately 25 ~ approximately 95 wt% of the copolymer, whereas said block copolymer bears an average molecular weight of at least approximately 1,000].

[0008]

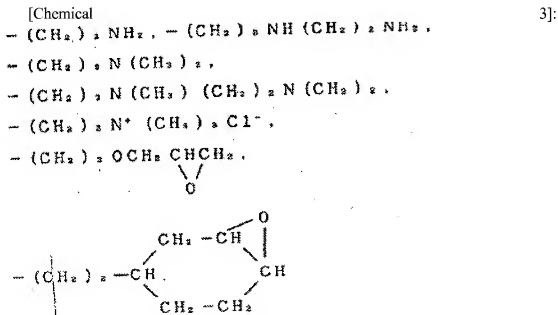
(Application embodiments of the invention)

In the aforementioned formula, the respective members of R<sup>1</sup>, which are mutually independent, signify monovalent hydrocarbon groups aliphatic unsaturated ones, and they

may, for example, be instantiated by a methyl group, ethyl group, propyl group, butyl group, octyl group, dodecyl group, phenyl group, phenetyl group, etc., and of these, the methyl group, ethyl group, & phenyl group are preferred, and above all, the methyl group is ideal.

[0009]

The  $R^3$  of the aforementioned group X is a direct bond or divalent hydrocarbon group in possession of 1 ~ 20 carbon atoms, which may, for example, be instantiated by  $-CH_2-$ ,  $-CH_2CH_2-$ ,  $-CH_2CH_2CH_2-$ ,  $-CH(CH_3)CH_2-$ ,  $-(CH_2)_4-$ ,  $-(CH_2)_6-$ ,  $-(CH_2)_8-$ ,  $-CH_2CH_2C_6H_4-$ ,  $-(CH_2)_{12}-$ , &  $-(CH_2)_{16}-$ , and of these, the propylene group is preferred. Moreover, the Z of the group X signifies a group inclusive of an amino group, group inclusive of an ammonium group, or group inclusive of an epoxy group. Groups X may, for example, be concretely instantiated by



although they are not particularly binding. Hair cosmetic ingredients inclusive of reactive silicone-type block copolymers wherein groups X are groups inclusive of amino groups such as  $-(CH_2)_3NH_2$ ,  $-(CH_2)_3NH(CH_2)_2NH_2$ ,  $-(CH_2)_3N(CH_3)_2$ ,  $-(CH_2)_3N(CH_3)(CH_2)_2N(CH_3)_2$ , etc. and/or groups inclusive of ammonium groups such as  $(CH_2)_3N^+(CH_3)_3Cl$ , etc. are desirable in that they are capable of improving hair textural

attributes in particularly effective manners, Of these, furthermore, ones wherein active hydrogen atoms of amino groups or ammonium groups such as  $-(CH_2)_3N(CH_3)_2-$ ,  $-(CH_2)_3N(CH_3)(CH_2)_2N(CH_3)_2$ ,  $-(CH_2)_3N^+(CH_3)_3Cl$ , etc. have been substituted with alkyl groups impart minimal odors and are therefore especially suitable for hair cosmetic ingredient applications.

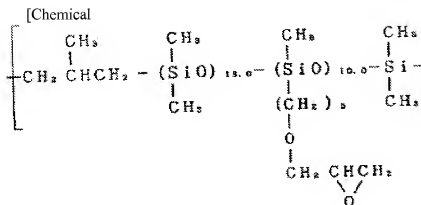
[0010]

Divalent hydrocarbon groups expressed by Y in the aforementioned formula are instantiated by  $-R^4$ ,  $-R^4-CO-$ ,  $-R^4-NHCO-$ ,  $-R^4-NHCONHR^5-NHCO-$ , &  $R^4-OOCNH-R^5-NHCO-$  (in these formulae,  $R^4$  is a divalent alkylene group such as an ethylene group, propylene group, butylene group, etc., whereas  $R^5$  is a divalent alkylene group such as groups instantiated as  $R^4$  or a divalent allylene [sic: Presumably "arylene"] group such as  $-C_6H_4-$ ,  $C_6H_4-C_6H_4-$ ,  $C_6H_4-CH_2-C_6H_4-$ ,  $-C_6H_4-$ ,  $-C_6H_4-CH(CH_3)-C_6H_4-$ , etc.). The following are desirable examples of groups Y:  $-CH_2CH_2-$ ,  $-CH_2CH_2CH_2-$ ,  $-CH_2CH(CH_3)CH_2-$ ,  $-CH_2CH_2CH_2CH_2-$ ,  $-(CH_2)_2CO-$ ,  $-(CH_2)_3NHCO-$ ,  $-(CH_2)_3NHCONHC_6H_4NHCO-$ , &  $-(CH_2)_3OOCNHC_6H_4NHCO-$ . Especially desirable groups Y are divalent alkylene groups, /4  $-CH_2CH_2-$ ,  $-CH_2CH_2CH_2-$ ,  $-CH_2CH(CH_3)CH_2-$ , etc., and of these,  $-CH_2CH(CH_3)CH_2-$  is the most desirable.

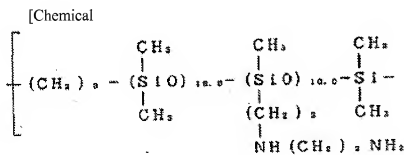
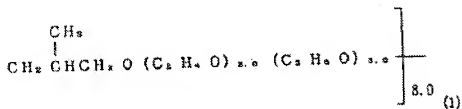
[0011]

The reactive silicone-type block copolymer of the present invention may, for example, be concretely instantiated by the ones listed below, although it goes without saying that they are not binding:

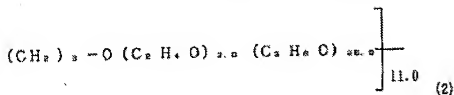




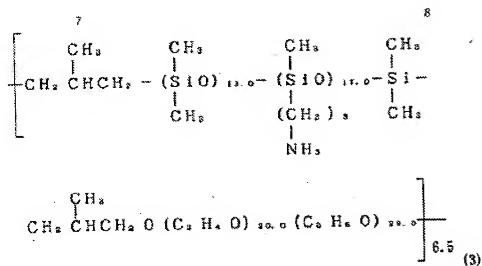
4):



5):

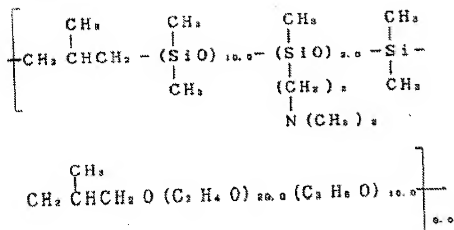


[Chemical6]:



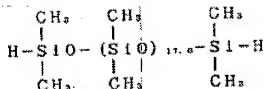
/5

[Chemical7]:



[0012]

The reactive silicone-type block copolymer used in the present invention can be manufactured by combining publicly known synthesizing methods of the prior art. A compound expressed by the aforementioned formula (1) may, for example, be obtained by addition-reacting, with a methylhydrodienopolysiloxane expressed by the following formula:

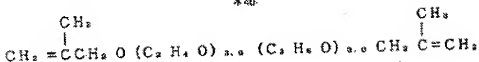


[Chemical8]:

a doubly terminal-methacryl-modified polyglycol expressed by the following formula:

[Chemical9]:

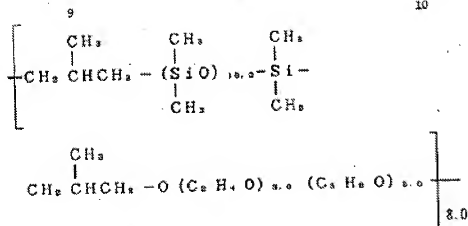
\*40.



in the presence of a platinum group catalyst and by subsequently reacting, with the obtained compound expressed by the following formula:

[Chemical

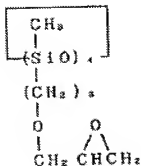
10]:



in the presence of an alkali catalyst in a re-equilibrating fashion, an epoxy-modified

/6

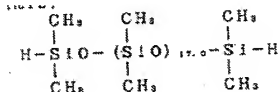
polysiloxane expressed by the following formula:



[Chemical 11]:

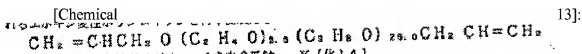
[0013]

Likewise, a compound expressed by the aforementioned formula (2) may be obtained by addition-reacting, with a methylhydrodienepolysiloxane expressed by the following formula:

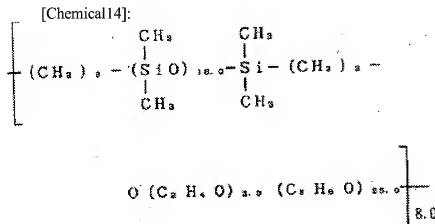


[Chemical 12]:

a doubly terminal-allyl-modified polyglycol expressed by the following formula:



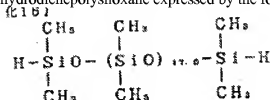
in the presence of a platinum group catalyst and by subsequently reacting, with the obtained compound expressed by the following formula:



$$\begin{array}{c} \boxed{\begin{array}{c} \text{CH}_3 \\ | \\ (\text{SiO})_4 \end{array}} \\ | \\ (\text{CH}_2)_5 \\ | \\ \text{NH}(\text{CH}_2)_2\text{NH}_2 \end{array}$$

[0014]

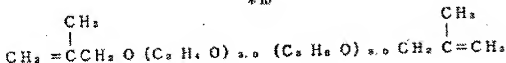
According to an alternative synthesizing method, furthermore, a compound expressed by the aforementioned formula (1) may, for example, be obtained by addition-reacting, with a methylhydrodienepolysiloxane expressed by the following formula:



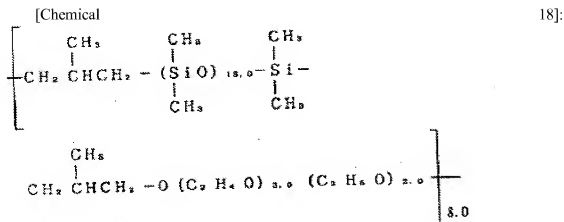
a doubly terminal-methacryl-modified polyglycol expressed by the following

\* 10

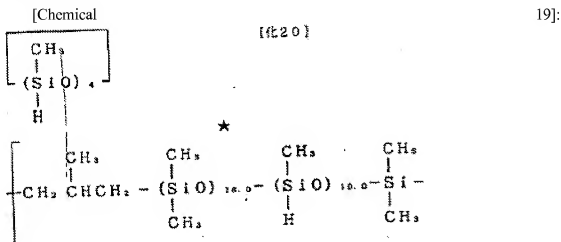
17]:



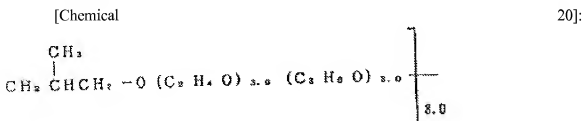
12



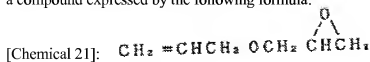
in the presence of an acid catalyst in a re-equilibrating fashion, a methylhydrodienepolysiloxane expressed by the following formula:



and by addition-reacting, with the obtained methylhydrodienepolysiloxane-polyglycol block copolymer expressed by the following formula:



a compound expressed by the following formula:



in the presence of a platinum group catalyst.

/8

[0015]

Moreover, a compound expressed by the aforementioned formula (2) can be obtained by addition-reacting  $\text{CH}_2=\text{CHCH}_2\text{Cl}$  with a corresponding methylhydrodienepolysiloxane-polyglycol block copolymer in the presence of a platinum group catalyst and by reacting the obtained product with ethylenediamine.

[0016]

It goes without saying that manufacturing methods are not particularly limited to the above-mentioned ones.

[0017]

The present invention provides a hair cosmetic ingredient inclusive of the aforementioned reactive silicone-type block copolymer, and it can be used in diverse morphologies. It may, for example, be solubilized or dispersed into an alcohol, hydrocarbon, volatile cyclic silicone, etc., or it may instead be dispersed within water by using a surfactant for providing an emulsion morphology. It can also be used as a sprayable form together with propellants such as propane, butane, trichloromonofluoromethane, dichlorodifluoromethane, dichlorotetrafluoroethane, gaseous carbon dioxide, gaseous nitrogen, etc. Ones of these morphologies can be used as shampoo agents, conditioner agents, set lotion agents, hair spray agents, permanent wave agents, mousse agents, hair dyeing agents, etc.

[0018]

Moreover, there are no restrictions on the mixing ratio of the aforementioned reactive silicone-type block copolymer within the hair cosmetic ingredient, although it is desirable for this ratio to be confined to a range of 0.01 wt% ~ 80 wt%, preferably 0.1 ~ 40 wt%. The reasons are because, in a case where the mixing ratio of the aforementioned reactive silicone-type block copolymer is excessively low, the effects of the present

invention become unimpressive and because, in a case where the same is excessively high, it becomes difficult to homogeneously coat the obtained product on hair. Moreover, in a case where the aforementioned reactive silicone-type block copolymer is mixed after having preliminarily been solubilized or dispersed into a volatile cyclic silicone, it is desirable in that handling can be facilitated and that hair affinity can be improved.

[0019]

It is possible to mix, with the hair cosmetic ingredient of the present invention, additives routinely mixed with hair cosmetic ingredients so long as they do not adversely affect the effects of the present invention. It is possible, for example, to mix, at appropriate quantitative ratios, silicone compounds (e.g., dimethylpolysiloxane, dimethylmethylphenylpolysiloxane, amino-modified dimethylpolysiloxane, epoxy-modified dimethylpolysiloxane, polyether-modified dimethylpolysiloxane, polycaprolactone-modified dimethylpolysiloxane,  $\alpha$ -olefin-modified dimethylpolysiloxane, etc.) of various forms (e.g., oil, resin, gum, rubber, powder, etc.), various oil components (e.g., tsukaki oil, rapeseed oil, sesame oil, safflower oil, cottonseed oil, castor oil, soybean oil, coconut oil, palm oil, beeswax, montan wax, lanoline, squalene, etc.), surfactants (e.g., alkylbenzenesulfonates, polyoxyalkylenealkylsulfuric acid esters, alkylsulfuric acid esters, alkanesulfonates, alkylethoxycarboxylates, succinic acid derivatives, alkylamine oxides, imidazoline-type compounds, polyoxyethylene alkyl or alkenyl ether, polyoxyethylene alkyl phenyl ether, high-molecular-weight fatty acid alkanolamides or corresponding alkylene oxide adducts, etc.), polymer compounds {e.g., hydroxyethyl cellulose, hydroxypropyl cellulose, hydroxypropylmethyl cellulose, methyl cellulose, cationized cellulose, cationized polymers, polyvinylpyrrolidone, copolymer of vinylpyrrolidone & vinyl acetate, vinylpyrrolidone-vinyl acetate-alkyl aminoacrylate copolymer, low-molecular-weight alkyl half ester of a methyl vinyl ether-maleic anhydride copolymer, vinyl acetate-crotonic acid copolymer, acrylic acid-acrylic acid ester-N-alkylacrylamide copolymer, vinyl acetate-crotonic acid (t-butyl)-vinyl benzoate copolymer, poly(sodium 2-acrylamide-2-



methylpropanesulfonate), vinylpyrrolidone-methacrylic acid-the acetic acid (t-butyl) copolymer, vinylpyrrolidone-acrylic acid or methacrylic acid copolymer, cationic resins mentioned in Japanese Patent Application Publication Kokai No. Hei 5[1993]-310538 Gazette, etc.}, antioxidants, ultraviolet absorbents, humidistat agents, perfumes, dyes, pigments, dyes [reiterated], preservatives, vitamin agents, hormone agents, deodorants, binders, etc.

[0020]

(Application examples)

In the following, the present invention will be explained with reference to application examples, although the present invention is not limited to these examples, and all application embodiments taking advantage of the technical concept of the present invention are within the scope of the present invention.

[0021]

Application Examples 1 ~ 9 & Comparative Examples 1 ~ 6: Hair cosmetic ingredients (general examples)

Products of the present invention 1 ~ 9 & comparative products 1 ~ 6 were prepared based on an ordinary method in compliance with the compositions shown in Tables I & II shown below, and their physical appearances were observed. Effects of these compositions on hairs were evaluated based on the method shown below, and the obtained results are shown in Tables I & II.

(Evaluation method)

30 cm/5 g of Japanese female head hairs with split ends were towed, and after 5 g of each composition had been directly coated on said hairs, it was spontaneously dried, and evaluations were then rendered according to the standards shown below. Subsequently, the

hair sample was washed five times based on the hair washing method shown below and then likewise evaluated. Moreover, each sample was brushed 20 times instead of being thus washed and then likewise evaluated. These evaluation results are shown in Tables I & II.

(Evaluation standards)

Adhesion effects: ☉: Adhered & unpeelable; ○: Adhered but slightly peelable; △: Adhered but virtually peelable; ×: Not adhered.

Tactile properties: Tactile sensations with hands were evaluated according to the 9 following standards: ☉: Extremely favorable overall tactile sensations; ○: Favorable overall tactile sensations; △: Rather unfavorable overall tactile sensations; ×: Extremely unfavorable overall tactile sensations.

Antistatic properties: ○: Neither dust adhesion nor hair entanglement; △: Slight dust adhesion acknowledged & some hair entanglement; ×: Dust adhesion & hair entanglement.

(Hair washing method)

After each hair sample had been coated with 0.3 g of a 2% aqueous sodium laurylsulfate solution, it was sufficiently washed with a warm oil [sic: Presumably “water?”] and then spontaneously dried.

[0022]

表1

成分 (重量%)	本発明品									
	1	2	3	4	5	6	6-2	7	8	9
・化合物1 ・化合物2 ・化合物3 ・化合物3-2 ・化合物4 ・化合物5 ・ポリジメチルシロキサンガム (分子量2,000,000)	5.0	1.0	10.0	5.0	5.0	5.0	5.0	4.0	4.0	4.0
・オクタメチルシクロペンタ シロキサン ・エタノール	95.0	99.0	90.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0
・外観 ・撥水性 initial 洗濯後 ブラッシング後 ・感触 initial 洗濯後 ブラッシング後 ・帯電防止性 initial 洗濯後 ブラッシング後	透明 均一	透明 均一	透明 均一	透明 均一	透明 均一	透明 均一	透明 均一	透明 均一	透明 均一	透明 均一
評	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎
価	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎
結	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎
品	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎	◎◎◎

Table I

[(1): Components (wt%); (2): Products of the present invention; (3): Compound; (4): Polydimethylsiloxane gum (molecular weight: 2,000,000); (5): Octamethylcycllopentasiloxane; (6): Ethanol; (7): Evaluation results; (8): Physical appearance; (9): Adhesion effects; (10): After hair washing; (11): After brushing; (12): Tactile sensations; (13): Antistatic properties; (14): Transparent & homogeneous]

表2

成分 (重量%)		比較品						
		1	2	3	4	4-2	5	8
化合物4		5.0					2.5	2.5
化合物5			5.0				2.5	
化合物6				5.0	5.0			2.5
化合物7						5.0		
化合物8								
オクタメチルシクロペンタシロキサン		95.0	95.0	95.0	95.0	95.0	95.0	95.0
・外 観		透明均一	半透明均一	透明均一	透明均一	透明均一	透明均一	透明均一
粘着効果 initial		◎	○	○	×	◎	○	○
洗髪後		×	△	△	×	◎	×	×
ブラッシング後		△	○	△	×	◎	○	×
乾燥後		○	○	○	△	◎	○	×
ブラッシング後		×	△	○	×	◎	○	×
静電防止性 initial		○	△	△	○	△	○	○
洗髪後		×	×	×	△	×	×	×
ブラッシング後		△	△	×	△	△	×	△

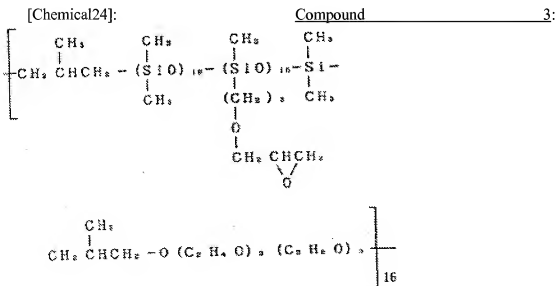
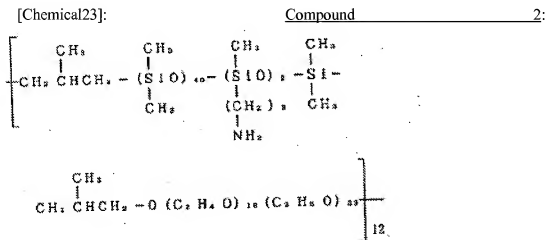
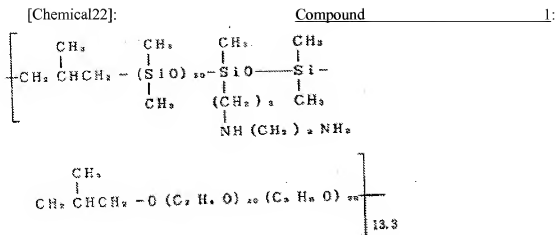
Table II

[(1): Components (wt%); (2): Comparative products; (3): Compound; (4): Octamethylcycllopentasiloxane; (5): Evaluation results; (6): Physical appearance; (7): Adhesion effects; (8): After hair washing; (9): After brushing; (10): Tactile sensations; (11): Antistatic properties; (12): Transparent & homogeneous]

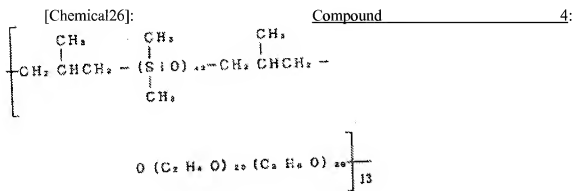
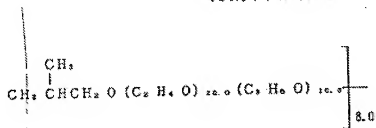
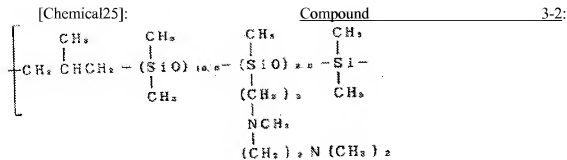
[0023]

/10

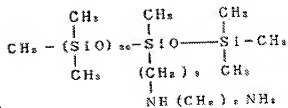
Compounds 1 ~ 8 used for preparing the respective products of the present invention 1 ~ 9 & comparative products 1 ~ 6 are expressed by the following formulae:

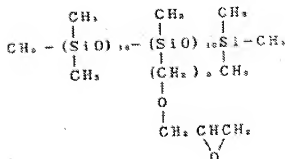


/11



/12

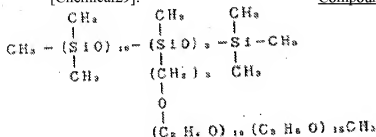
[Chemical 27]: Compound 5:



[Chemical 28]: Compound 6:

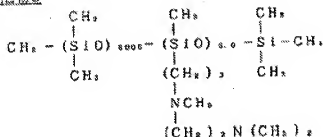
[Chemical 29]:

Compound \_\_\_\_\_ 7:



化審番号 [Chemical 30]:

Compound \_\_\_\_\_ 8:



[0024]

/13

As Table I & Table II indicate, the products of the present invention 1 ~ 9 were excellent in terms of each of physical appearances, hair split end adhesion effects, tactile sensations, & antistatic properties, and since the attenuations of these effects were minimal even after hair washing & brushing, they were ideal as hair cosmetic ingredients. In contrast, comparative products 1 ~ 6 deviating from the scope of the present invention either failed to satisfy these performances simultaneously or exhibited significant attenuations of effects after hair washing & brushing.

[0025]

Application Example 10: Shampoo agent

In a case where a shampoo agent was prepared in compliance with the prescription shown in Table III below, a favorable shampoo agent bearing a favorable foamability, excellent post-hair-wash hair finished states, textural attributes, luster, settability, tactile sensations, combing friendliness, effects of preventing & repairing hairs with split ends, etc., imparting voluminous, bulky, & moist impressions, unaccompanied by problematic generation & accumulation of static electricity, etc., and capable of sustaining the aforementioned effects even after hair washing & brushing was obtained.

[Table 3]

Table III

Components	Mixing ratio (parts by weight)
Sodium C <sub>14</sub> - $\alpha$ -olefinsulfonate	15.0
Glycerin monostearate	5.0
Compound 1	1.0
Octamethylcyclopentasiloxane	8.0
Polyethylene glycol (molecular weight: 9,000) distearate	0.5
Sodium benzoate (pasteurizer)	1.0
Perfume	Some
Yellow No. 203 (dye)	0.01
Citric acid (for adjusting pH at 5.8)	Some
Purified water	Balance



[0026]

Application Example 11: Shampoo agent

In a case where a shampoo agent was prepared by using the compound 2 in place of the compound 1 according to procedures otherwise utterly similar to those in Application Example 10, a favorable shampoo agent was obtained, as in Application Example 10.

[0027]

Application Example 12: Shampoo agent

In a case where a shampoo agent was prepared by using the compound 3 in place of the compound 1 according to procedures otherwise utterly similar to those in Application Example 10, a favorable shampoo agent was obtained, as in Application Example 10.

[0028]

Application Example 13: Hair treatment agent

In a case where a hair treatment agent was prepared in compliance with the prescription shown in Table IV below, a favorable hair treatment agent bearing excellent post-treatment hair finished states, textural attributes, luster, settability, tactile sensations, combing friendliness, effects of preventing & repairing hairs with split ends, etc., imparting voluminous, bulky, & moist impressions, unaccompanied by problematic generation & accumulation of static electricity, etc., and capable of sustaining the aforementioned effects even after hair washing & brushing was obtained.

[Table 4]

Table IV

/14

Components	Mixing ratio
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	(parts by weight)
Compound 1	10.0
Fluid paraffin	2.0
Spontaneously emulsifiable monostearic acid glyceride	3.0
Ethylene glycol monostearate	5.0
Cetyl alcohol	0.5
Dimethylbenzyl ammonium chloride	3.0
Preservative	Some
Perfume	Some
Purified water	Balance

[0029]

Application Example 14: Hair treatment agent

In a case where a hair treatment agent was prepared by using the compound 2 in place of the compound 1 according to procedures otherwise utterly similar to those in Application Example 13, a favorable hair treatment agent was obtained, as in Application Example 13.

[0030]

Application Example 15: Hair treatment agent

In a case where a hair treatment agent was prepared by using the compound 3 in place of the compound 1 according to procedures otherwise utterly similar to those in Application Example 13, a favorable hair treatment agent was obtained, as in Application Example 13.

[0031]

Application Example 16: Hair spray agent

In a case where a hair spray agent was prepared in compliance with the prescription shown in Table V below, a favorable hair spray agent bearing excellent post-treatment hair finished states, textural attributes, luster, settability, tactile sensations, combing friendliness, effects of preventing & repairing hairs with split ends, etc., imparting voluminous, bulky, & moist impressions, unaccompanied by problematic generation & accumulation of static electricity, etc., and capable of sustaining the aforementioned effects even after hair washing & brushing was obtained.

[Table 5]

Table V

Components	Mixing ratio (parts by weight)
Compound 1	11.0
Octamethylcyclotrasiloxane	15.0
Perfume	Some
Trichlorofluoromethane	37.0
Dichlorodifluoromethane	37.0

[0032]

Application Example 17: Hair spray agent

In a case where a hair spray agent was prepared by using the compound 2 in place of the compound 1 according to procedures otherwise utterly similar to those in Application Example 16, a favorable hair spray agent was obtained, as in Application Example 16.

[0033]

Application Example 18: Hair spray agent

In a case where a hair spray agent was prepared by using the compound 3 in place of the compound 1 according to procedures otherwise utterly similar to those in Application Example 16, a favorable hair spray agent was obtained, as in Application Example 16.

[0034]

Application Example 19: Hair liquid agent

In a case where a hair liquid agent was prepared in compliance with the prescription shown in Table VI below, a favorable hair liquid agent bearing excellent post-treatment hair finished states, textural attributes, luster, settability, tactile sensations, combing friendliness, effects of preventing & repairing hairs with split ends, etc., imparting voluminous, bulky, & moist impressions, unaccompanied by problematic generation & accumulation of static electricity, etc., and capable of sustaining the aforementioned effects even after hair washing & brushing was obtained.

[Table 6]

Table VI

/15

Components	Mixing ratio (parts by weight)
------------	--------------------------------------

Compound 1	5.0
Octamethylcyclopentasiloxane	10.0
Polyoxypropylene (30) butyl ether	10.0
Polyethylene glycol 6000	5.0
Perfume	Some
Ethanol	39.0
Purified water	31.0

[0035]

Application Example 20: Hair liquid agent

In a case where a hair liquid agent was prepared by using the compound 2 in place of the compound 1 according to procedures otherwise utterly similar to those in Application Example 19, a favorable hair liquid agent was obtained, as in Application Example 19.

[0036]

Application Example 21: Hair liquid agent

In a case where a hair liquid agent was prepared by using the compound 3 in place of the compound 1 according to procedures otherwise utterly similar to those in Application Example 19, a favorable hair liquid agent was obtained, as in Application Example 19.

[0037]

Application Example 22: Shampoo agent

In a case where a shampoo agent was prepared in compliance with the prescription shown in Table VII below, a favorable shampoo agent bearing a favorable foamability, excellent post-hair-wash hair finished states, textural attributes, luster, settability, tactile sensations, combing friendliness, effects of preventing & repairing hairs with split ends, etc.,

imparting voluminous, bulky, & moist impressions, unaccompanied by problematic generation & accumulation of static electricity, etc., and capable of sustaining the aforementioned effects even after hair washing & brushing was obtained.

[Table 7]

Table VII

Components	Mixing ratio (parts by weight)
Sodium C <sub>14</sub> - $\alpha$ -olefinsulfonate	15.0
Glycerin monostearate	4.0
Compound 1	0.8
Compound 5	0.2
Octamethylcyclotrisiloxane	8.0
Polyethylene glycol (molecular weight: 9,000) distearate	0.5
Sodium benzoate (pasteurizer)	1.0
Perfume	Some
Yellow No. 203 (dye)	0.01
Citric acid (for adjusting pH at 5.8)	Some
Purified water	Balance

[0038]

Application Example 23: Shampoo agent

In a case where a shampoo agent was prepared by using the compound 2 in place of the compound 1 according to procedures otherwise utterly similar to those in Application Example 22, a favorable shampoo agent was obtained, as in Application Example 22.

[0039]

Application Example 24: Shampoo agent

In a case where a shampoo agent was prepared by using the compound 3 in place of the compound 1 according to procedures otherwise utterly similar to those in Application Example 22, a favorable shampoo agent was obtained, as in Application Example 22.

[0040]

Application Example 25: Shampoo agent

In a case where a shampoo agent was prepared by using a polydimethylsiloxane gum (molecular weight: 2,000,000) in place of the compound 5 according to procedures otherwise utterly similar to those in Application Example 22, a favorable shampoo agent was obtained, as in Application Example 22.

[0041]

Application Example 26: Shampoo agent

In a case where a shampoo agent was prepared by using the compound 2 in place of the compound 1 according to procedures otherwise utterly similar to those in Application Example 25, a favorable shampoo agent was obtained, as in Application Example 25.

[0042]

Application Example 27: Shampoo agent

In a case where a shampoo agent was prepared by using the compound 3 in place of the compound 1 according to procedures otherwise utterly similar to those in Application Example 25, a favorable shampoo agent was obtained, as in Application Example 25.

[0043]

Application Example 28: Aerosol hair lacquer

In a case where an aerosol hair lacquer was prepared in compliance with the prescription shown in Table VIII below, a favorable aerosol hair lacquer bearing excellent post-treatment hair settability, finished states, luster, tactile sensations, combing friendliness, effects of preventing & repairing hairs with split ends, etc., imparting voluminous, /16 bulky, & moist impressions, unaccompanied by problematic generation & accumulation of static electricity, etc., and capable of sustaining the aforementioned effects even after hair washing & brushing was obtained.

[Table 8]

Table VIII

(Raw liquid prescription)	
Components	Mixing ratio (parts by weight)
Compound 1	3.0
Vinyl acetate (65 wt%)-crotonic acid (10 wt%)-vinyl tert-butyl-benzoate (25 wt%) copolymer	10.0
2-amino-2-methyl-1-propanol for neutralizing 100% of acidic functional groups of the	Necessary quantity



aforementioned copolymer	
Ethanol	Balance for adjusting the total at 100 parts by weight
(Filling prescription)	
Components	Mixing ratio (parts by weight)
Raw liquid	40.0
Dimethyl ether	40.0
Pentane	20.0

[0044]

Application Example 29: Aerosol hair lacquer

In a case where an aerosol hair lacquer was prepared by using the compound 2 in place of the compound 1 according to procedures otherwise utterly similar to those in Application Example 27, a favorable aerosol hair lacquer was obtained, as in Application Example 27.

[0036]

Application Example 30: Aerosol hair lacquer

In a case where an aerosol hair lacquer was prepared by using the compound 3 in place of the compound 1 according to procedures otherwise utterly similar to those in Application Example 27, a favorable aerosol hair lacquer was obtained, as in Application Example 27.

[0046]

Application Example 31: Shampoo agent

In a case where a shampoo agent was prepared by using the compound 3-2 in place of the compound 1 according to procedures otherwise utterly similar to those in Application Example 10, a favorable shampoo agent utterly unaccompanied by amine odors was obtained, as in Application Example 10.

[0047]

Application Example 32: Hair cosmetic foamy aerosol

In a case where a hair cosmetic foamy aerosol was prepared in compliance with the prescription shown in Table IX below, a favorable hair cosmetic foamy aerosol utterly unaccompanied by amine odors, bearing excellent post-treatment hair finished states, textural attributes, luster, settability, tactile sensations, combing friendliness, effects of preventing & repairing hairs with split ends, etc., imparting voluminous, bulky, & moist impressions, unaccompanied by problematic generation & accumulation of static electricity, etc., and capable of sustaining the aforementioned effects even after hair washing & brushing was obtained.

[Table 9]

Table IX

/17

Components	Mixing ratio (parts by weight)
Isoparaffin	8.0
Compound 3-2	5.0
Polyoxyethylene (120) cured castor oil	2.0
Glycerin	1.0

Cationic resin solution	5.0
Ethanol	10.0
Ion-exchanged water	Balance
n-Butane	8.0
Perfume	Some

[0048]

Incidentally, the cationic resin solution shown in Table IX is one among those mentioned in Japanese Patent Application Publication Kokai No. Hei 5[1993]-310538 Gazette and is prepared based on the following method. In other words, 55 parts by weight of dimethylaminoethyl methacrylate, 15 parts by weight of lauryl acrylate, 20 parts by weight of cetyl methacrylate, 10 parts by weight of behenyl methacrylate, and 100 parts by weight of anhydrous were charged into a five-neck flask to which a reflux cooler, a drop funnel, a thermometer, a nitrogen substitution glass tube, & an agitation mechanism had been attached, and after 0.3 part by weight of azobisisobutyronitrile had been further added, the contents were heated & refluxed in a nitrogen streamed state at 80°C, and after 0.6 part by weight of azobisisobutyronitrile had been further supplemented 2 hours later, the contents were polymerized at the same temperature over a 6-hour period. Next, 53.9 parts by weight of diethyl sulfate (molar equivalent of dimethylaminoethyl methacrylate) and 100 parts by weight of anhydrous ethanol were added to the obtained product, and the contents were further reacted & modified in a nitrogen streamed state at 50°C over a 10-hour period. Next, a cationic resin solution with a polymer internalization ratio of 30 wt% was obtained by adjusting the ethanol internalization ratio. The pre-modification weight-based average molecular weight of this resin was 120,000.

[0049]

(Effects of the invention)

The hair cosmetic ingredient of the present invention can, by virtue of the inclusion of a specified polydiorganosiloxane-polyoxyalkylene alternating block copolymer to which a reactive group has been introduced, be used as shampoo agents, conditioner agents, set lotion agents, hair spray agents, permanent wave agents, mousse agents, hair dyeing agents, etc. which are superior to their counterparts of the prior art, which bear favorable foamability & emulsifiability, which yields, in a case where it is used for hair treatments, excellent hair finished states, textural attributes, luster, settability, tactile sensations, combing friendliness, effects of preventing & repairing hairs with split ends, etc., which impart voluminous, bulky, & moist impressions, which are unaccompanied by problematic generation & accumulation of static electricity, etc., and which are capable of sustaining the aforementioned effects in response to daily hair care treatments such as shampooing, brushing, etc., and thus, it is extremely effective from an industrial point of view.